

Latest Developments on the Live Access Server

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Suggestions?

(past team members)

Funded by:

- NOAA
- NASA
- US Navy
- NSF
- NOPP

Ver. 1.0 – 1994

I hate outlines

- Review
- What's new
- What's next

Review

Definition

Main Entry: L· A· S
Pronunciation: 'el-ay-es
Function: noun

1. a configurable product server for 1 to 4D geo-science datasets

Merriam-Webster Dictionary
2005 Hankin edition

The screenshot shows the GFDL Data Portal homepage. At the top, there are two buttons: "single data set" (selected) and "compare two". Below them is a sidebar with links: Datasets, Variables, Constraints, Output, Previous Output, Define variable, and About. The main content area features the NOAA logo and a circular seal for the GFDL Data Portal. A welcome message says: "Welcome to LAS. You must have pop-ups enabled for this site in order to see your output. This session will expire after 180 minutes of inactivity." A central message box says: "Click on a dataset to continue or an ⓘ for information about a dataset." Below this are sections for DecCen Experiments, Intergovernmental Panel on Climate Change Experiments (Atmospheric data), CM2.0 Model Runs, CM2.1 Model Runs, and Intergovernmental Panel on Climate Change Experiments (Ocean tripolar data). Each section lists various datasets with their descriptions.

http://data1.gfdl.noaa.gov:8380/DataPortal/servlets/dataset?catitem=287

Review

"Configurable":

- Information hierarchy
- Variables and products
- User Interface
- Sister servers

Architecture basics

A science “home page”

Information access

[Oceans and Climate](#)

[Climate Diagnostics](#)

[Weather and Atmosphere](#)

http://www.gfdl.noaa.gov/~lpj/WAD/Group_old.html

Parallel data access

Live Access Server

stration server - Netscape

//ferret.pmel.noaa.gov:8180/DecCen_devel/servlets/constraint?var=22

What's Related

Search:

GPS - demonstration server

Select your desired view (geometry of output) and output (type of product). Then set the 4-D region (lon-lat-depth-time) and any additional constraints.

Help

xy (lat/lon) slice

Shaded plot (GIF)

Full Region

Don't use map applet

88.6289978

180.0 W 180.0 E

88.6289978

Zoom In Zoom Out

http://www.gfdl.noaa.gov/~lpj/WAD/Group_old.html

Information hierarchy: NVODS LAS as an example

The image displays a 3x3 grid of Microsoft Internet Explorer windows, each showing a different institution's page within the NVODS LAS system. The institutions shown are:

- Top Row:**
 - COLA (Center for Ocean-Atmospheric Prediction Studies)
 - IPRC (International Pacific Research Center)
 - NOAA/NCEP Climate Diagnostics Center
- Middle Row:**
 - Jet Propulsion Laboratory (California Institute of Technology)
 - Pacific Marine Environmental Laboratory
 - University of Hawaii Sea Level Center
- Bottom Row:**
 - IRI (International Research Institute for Climate Prediction)
 - Pacific Marine Environmental Laboratory (continued from middle row)
 - Pacific Marine Environmental Laboratory (continued from middle row)

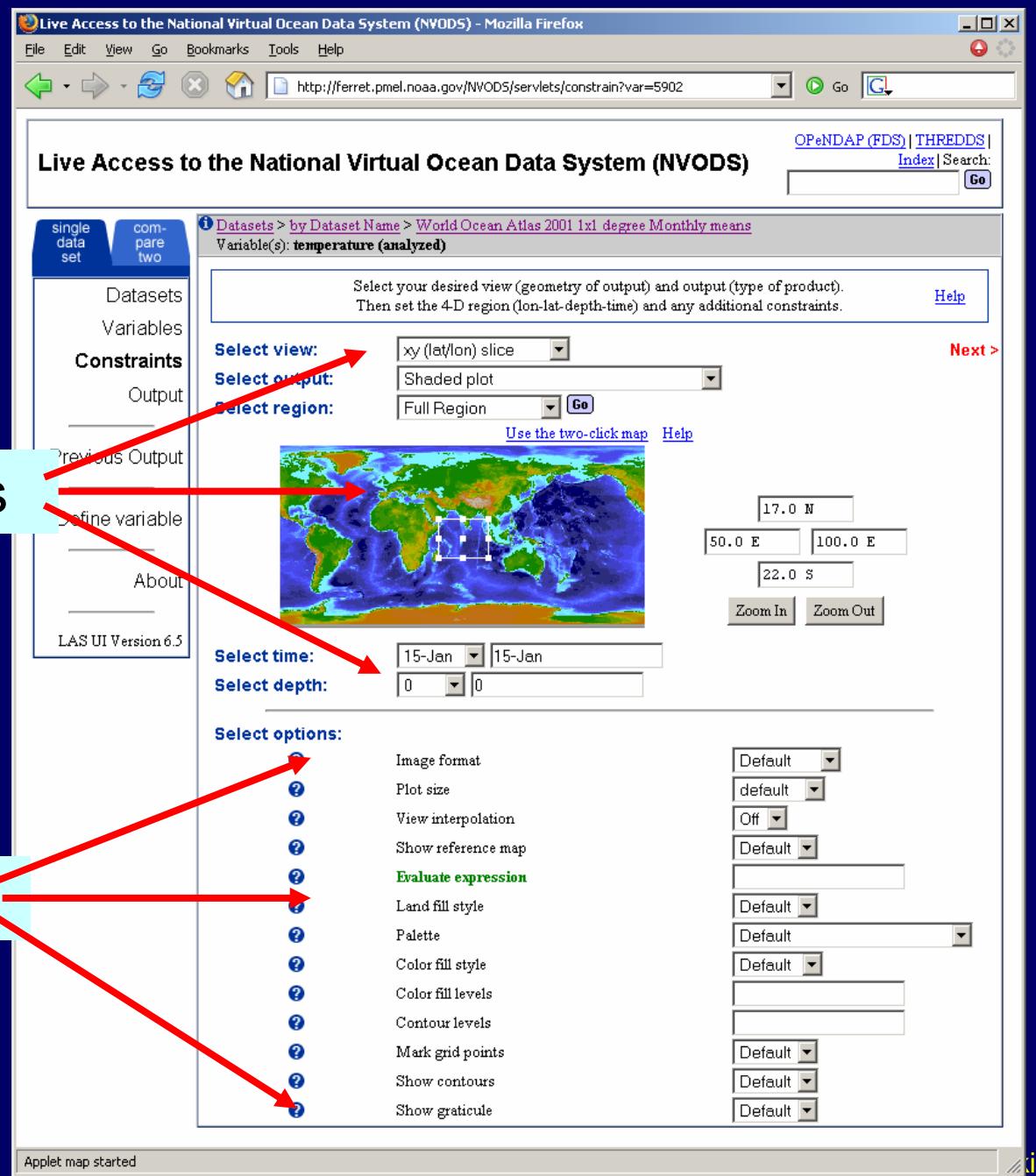
Each window shows a navigation bar with 'File', 'Edit', 'View', 'Favorites', 'Tools', and 'Help'. A search bar at the top right contains 'OPeNDAP (FDS) | THREDDS | Index | Search' and a 'Go' button. The main content area includes a 'Datasets' section with 'single data set' and 'compare two' buttons, and a 'Select dataset' dropdown menu.

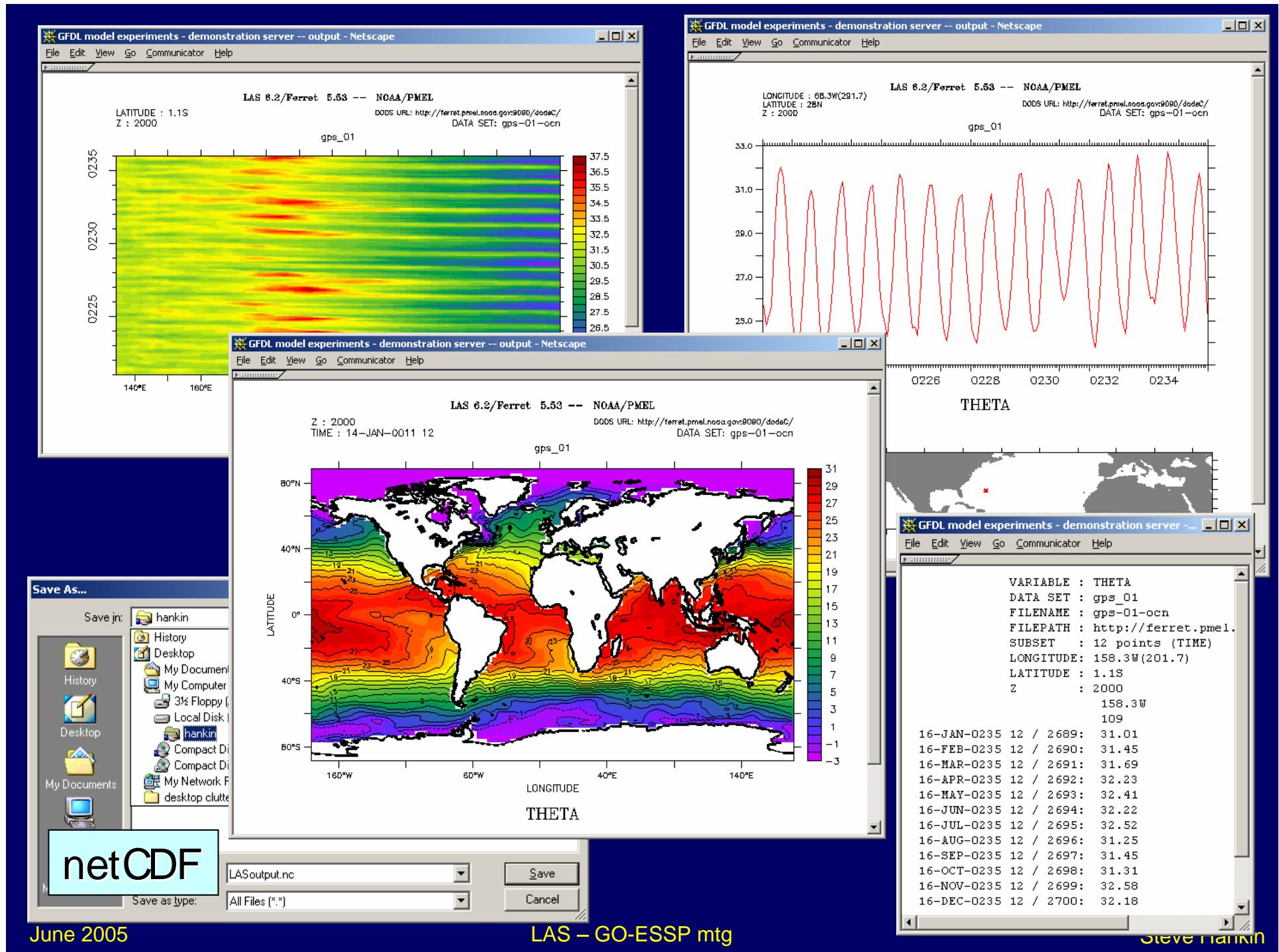
Bottom Left: June 2005

A typical “main” window of the user interface

basic constraints

configurable options





Compare variables from different datasets

US GODAE Model Results - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://ferret.pmel.noaa.gov/GODAE/servlets/dataset_compare2

US GODAE Model Results

Search: Go

1: Datasets > Ocean Models > JPL Global Assimilation (adjoint)
2: Datasets

Click on a dataset to continue or an **i** for information about a dataset. Help

Please select a dataset from below

Data from CDC

[NODC World Ocean Atlas 1998](#)
[NCEP Pacific Analysis](#)
[Reynolds SST](#)
[Reynolds Reconstructed SST](#)

Data from GFDL

[GFDL Global Simulation](#)
[GFDL Global Assimilation](#)

Data from HYCOM (sigma coords)

[North Atlantic \(1/3 deg\)](#)
[North Atlantic \(1/12 deg\)](#)

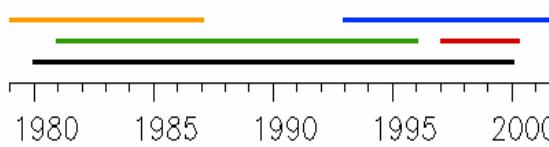
Data from JPL

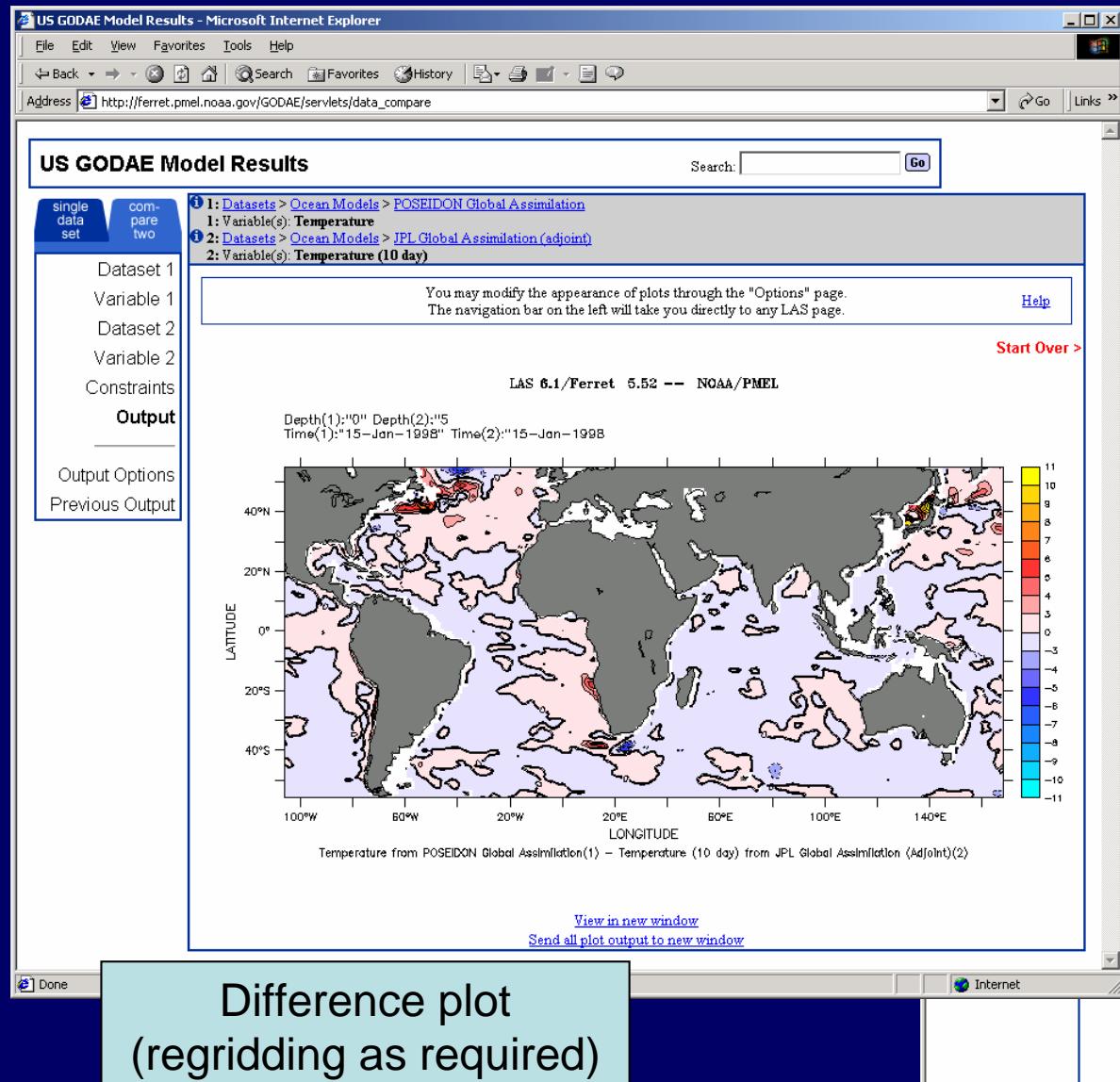
[JPL Global Simulation](#)
[JPL Global Assimilation \(adjoint\)](#)

Data from NSIPP

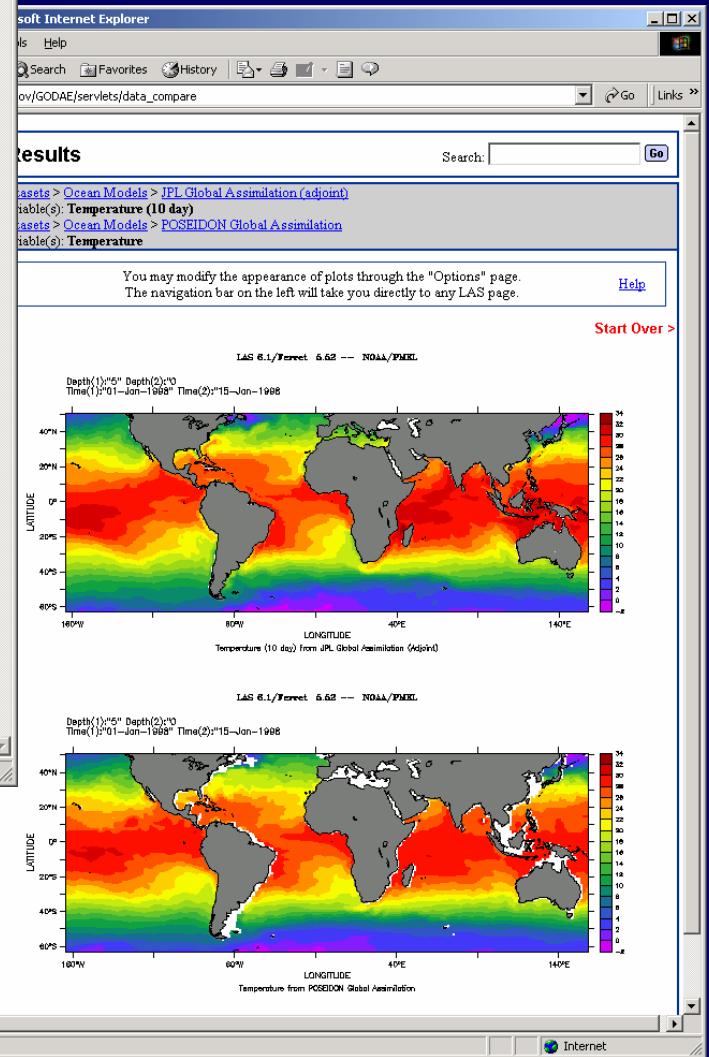
[POSEIDON Global Assimilation](#)

Output Options
Previous Output





Difference plot
 (regridding as required)



Compute simple analyses

US GODAE Model Results

Select analysis type: Average

Name for this variable: Temp_avey

Apply to these axes: X Y Z T

Mask: None Ocean Land

Select range for applicable axis:

Don't use map applet

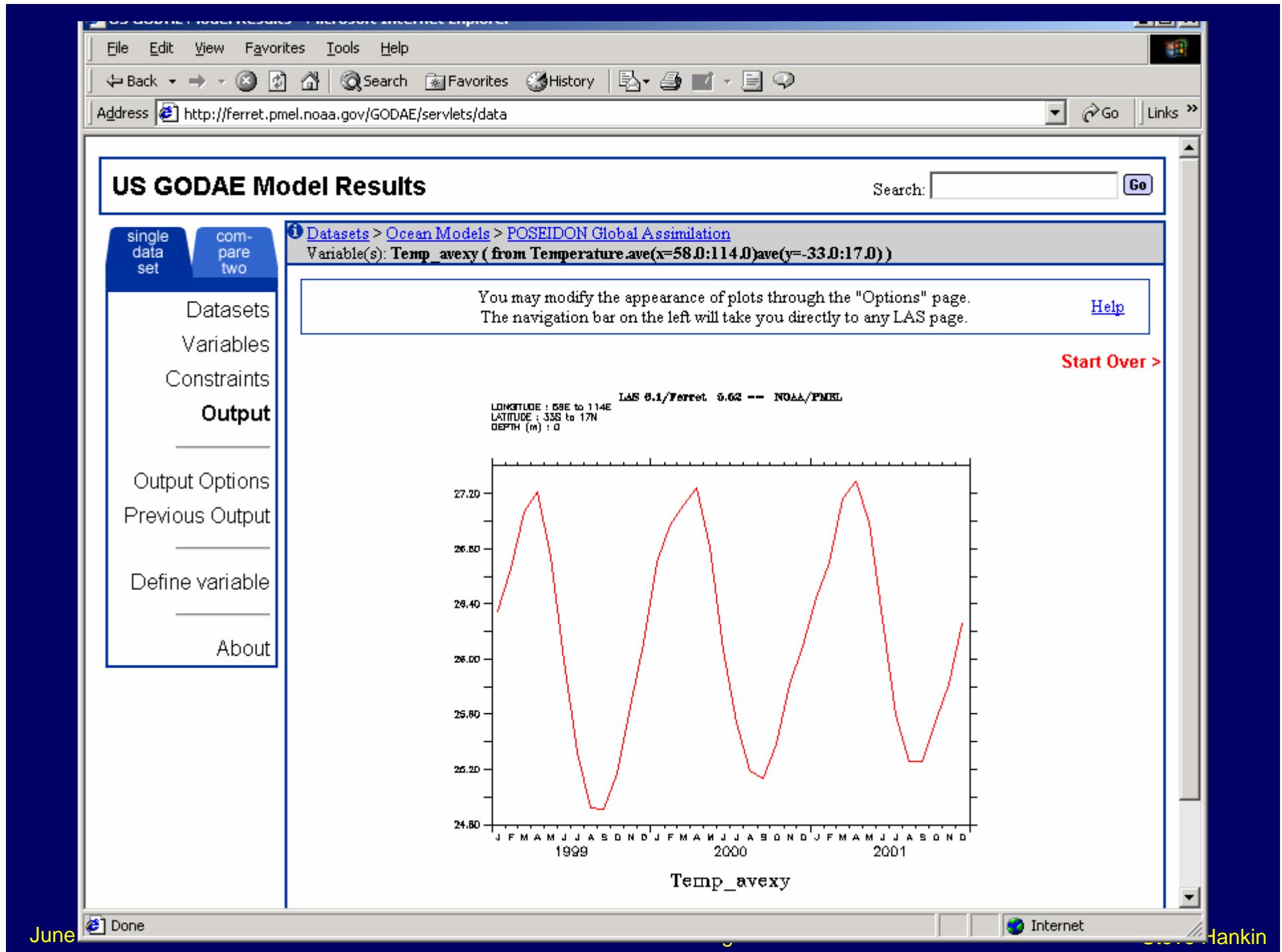
17.0 N
58.0 E 114.0 E
33.0 S

Zoom In Zoom Out

Z range: 0 0 to 2000 2000

T range: 15 Jan 1993 15-Jan-1993 to 15 Dec 2001 15-Dec-2001

The screenshot shows a web-based application for performing model analyses. On the left, a sidebar has buttons for 'single data set' (highlighted), 'compare two', 'Datasets', 'Variables', 'Constraints', 'Output', 'Output Options', 'Previous Output', 'Define variable' (highlighted with a red circle), and 'About'. The main area title is 'US GODAE Model Results' under 'Datasets > Ocean Models > POSEIDON Global Assimilation Variable(s) Temperature'. It prompts to select an analysis type and axes. A dropdown 'Select analysis type' is set to 'Average', and the variable name 'Temp_avey' is entered. Axes X and Y are selected. A 'Mask' section shows 'None' is selected. Below, a world map shows temperature contours with a bounding box over the North Pacific. A zoom control shows coordinates 17.0 N, 58.0 E, 114.0 E, and 33.0 S. Range sliders for Z (0 to 2000) and T (15-Jan-1993 to 15-Dec-2001) are at the bottom.



In-situ observations

Live Access to USGODAE Data - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://usgodaе3.usgodaе.org/las/servlets/constrain?var=990

Live Access to USGODAE Data

OPeNDAP (FDS) | THREDDS | Index

single data set compare two

Datasets Variables Constraints Output

Previous Output Define variable About

LAS UI Version 6.5

1 Datasets > USGODAE Data Sets > In-Situ Data > USGODAE Surface Observations Variable(s): SST Observations

Select your desired view (geometry of output) and output type. Then set the 4-D region (lon-lat-depth-time) and any additional constraints.

Select view: Latitude-longitude (xy)

Select output: Raw data plot

Select region: Full Region Go Use the two-click map Help

Select time range: 01 Jun 2005 01-Jun-2005 02 Jun 2005 02-Jun-2005

Select Constraints:

Apply: SST Obs. Type = 1. XBT Temperatures (C)

Apply: SST QCValue < 0.0

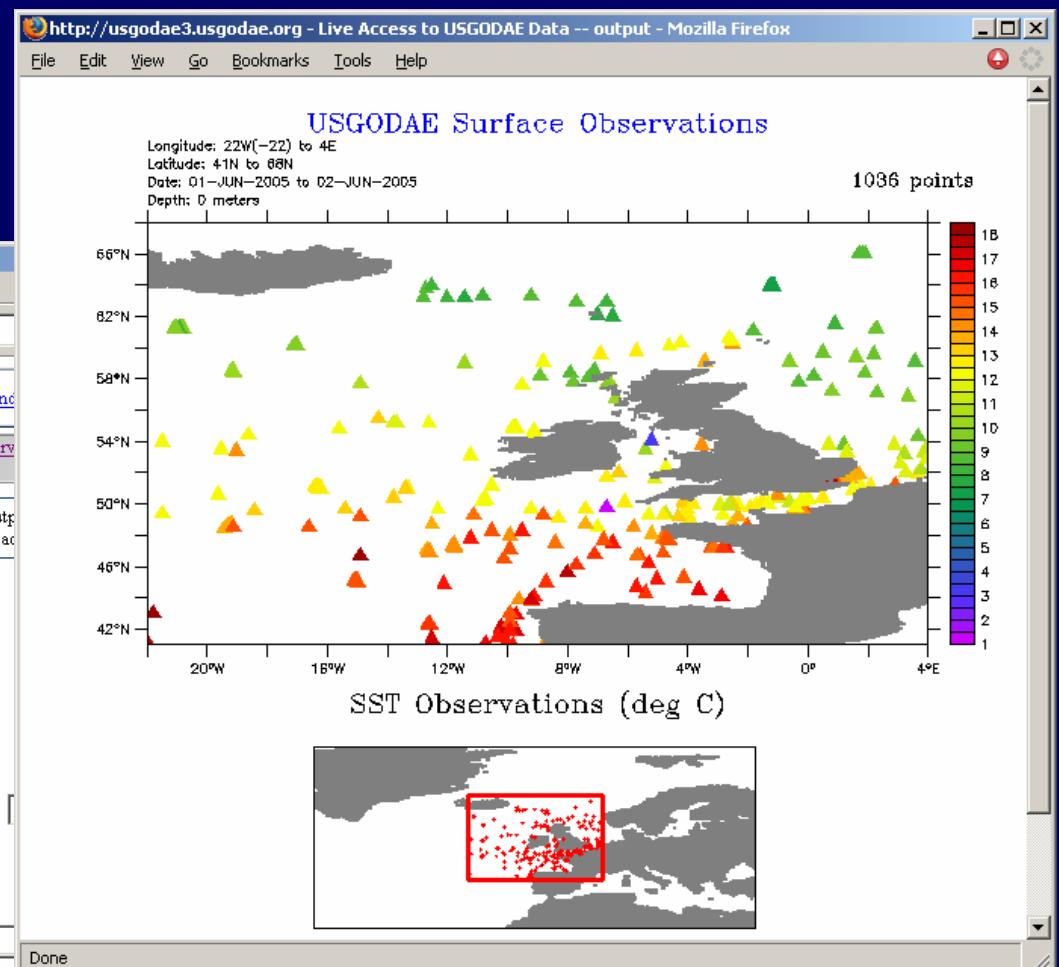
Select options:

② Image format Default

② Palette Default

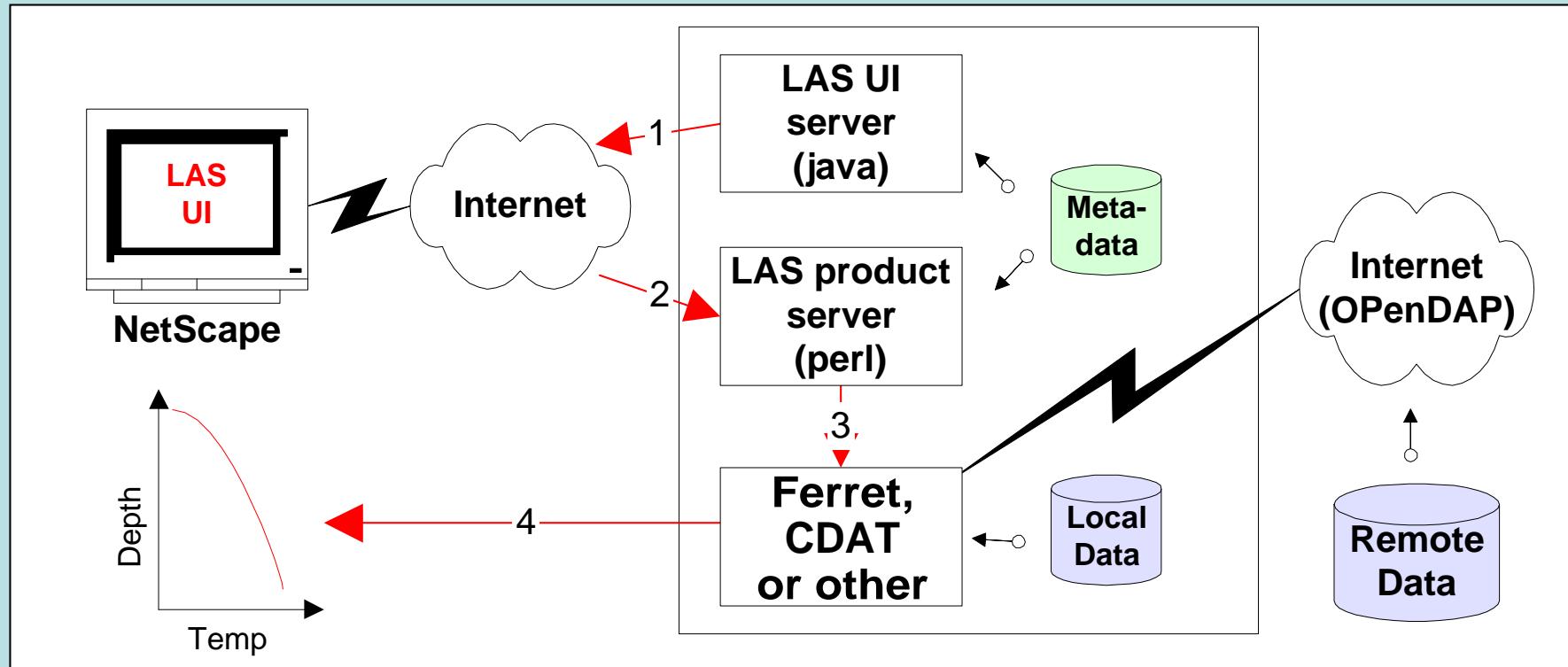
② Color fill levels

Applet map started

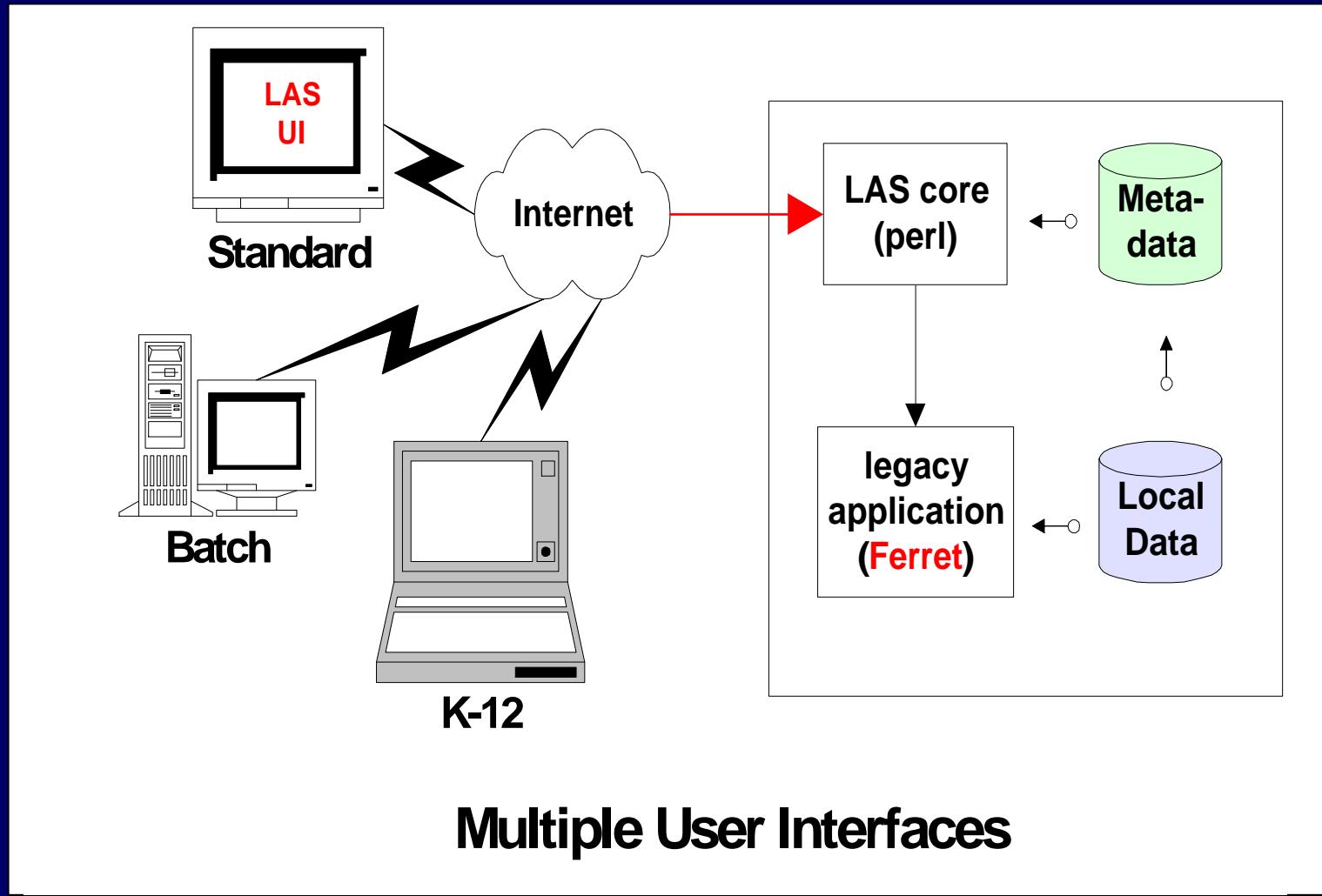


← custom “constraints”

LAS -- an “Information Product Server”



- XML Metadata contains the “intelligence”
- Back end applications do the real work
- OPeNDAP provides remote data access



The UI talks to LAS through an XML "web service"

radical
custom
UIs:
e.g. for
K-12
students

(LAS v6.5
includes a
JavaScript
API)

Adopt a Drifter tracking page - Microsoft Internet Explorer

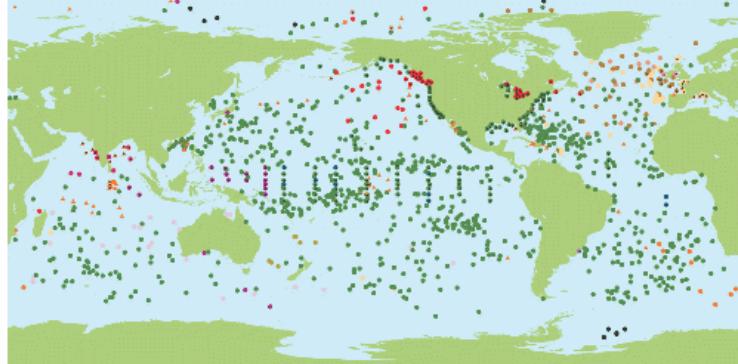
File Edit View Favorites Tools Help

Address http://stout.pmel.noaa.gov/~kobrien/adopt_a_drifter.html

Links CVS LAS pending PMEL DMAC ~HANKIN FERRET Home NOAA Locator Webster Google

NOAA OFFICE OF CLIMATE OBSERVATION (OCO)

Welcome to the *Adopt a Drifter* Tracking Page



Enter WMO ID of Drifter

<input checked="" type="radio"/> 13533	<input type="radio"/> 13602	Select Variable:
<input type="radio"/> 41540	<input type="radio"/> 41939	<input checked="" type="radio"/> Sea Surface Temperature
<input type="radio"/> 41942	<input type="radio"/> 41943	<input type="radio"/> Sea Level Pressure

Select Product:

<input checked="" type="radio"/> Map showing measurements
<input type="radio"/> Map showing drifter track dates
<input type="radio"/> Table of measurements

Fetch!

Done Internet

“Scripted” access to LAS

Query available data sets:

```
>lasls http://cpu/LAS
```

Query variables in data set “model_1”:

```
>lasls http://cpu/LAS model_1
```

Query space-time domain:

```
>lasls http://cpu/LAS model_1 sst
```

Request a subset of data as a file: (“asc” for ASCII format)

```
>lasget -x 20:60 -y 20:60 -t 11-Dec-2000 -f asc  
http://cpu/LAS model_1 sst
```

Custom-ized UIs: variations on familiar look and feel

NDBC LAS Test Server - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address https://access.pmel.noaa.gov/xwang_las_test/servlets/dataset,DanaInfo=stout.pmel.noaa.gov+

OPeNDAP (FDS) | THREDDS | Index | Search: Go

NDBC LAS Test Server

Datasets > NDBC Mooring Data

single data set compare two

Datasets Variables Constraints Output

Previous Output Define variable About

LAS UI Version 6.5

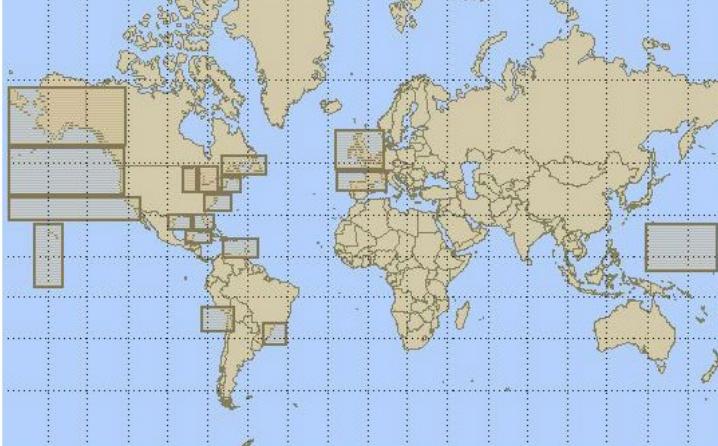
National Data Buoy Center
Center of Excellence in Marine Technology

NATIONAL WEATHER SERVICE

Click on a region from the map or from the list following the map to select that region.

Welcome to LAS.
You must have pop-ups enabled for this site in order to see your output.
This session will expire after 180 minutes of inactivity.

NDBC Mooring Data



[NDBC Mooring Data at US Northeast Coast](#)
[NDBC Mooring Data at US Southeast Coast](#)

I hate outlines

- Review
- • What's new
- What's next

LAS and THREDDS

THematic Realtime Environmental Distributed Data Services
(from Unidata)

-- an XML summary of a data collection --

1. LAS can generate a THREDDS catalog
2. LAS will auto-configure from a THREDDS catalog

THREDDS output

```
<?xml version="1.0" ?>
- <catalog name="LAS THREDDS Inventory Catalog" version="1.0"
  xmlns="http://www.unidata.ucar.edu/namespaces/thredds/InvCatalog/v1.0"
  xmlns:xlink="http://www.w3.org/1999/xlink">
  - <dataset name="Pacific Marine Environmental Lab">
    <service name="las.xml"
      base="http://data1.gfdl.noaa.gov/DataPortal-FDS/LAS/"
      serviceType="DODS" />
  - <dataset name="AMIP 12b Exp 01">
    <dataset name="evaporation rate"
      urlPath="amip_12b_01all_nc/evap" serviceName="las.xml" />
    <dataset name="height" urlPath="amip_12b_01all_nc/ght"
      serviceName="las.xml" />
    <dataset name="LW flux down at surface"
      urlPath="amip_12b_01all_nc/lwdn_sfc"
      serviceName="las.xml" />
    <dataset name="LW flux up at surface"
      urlPath="amip_12b_01all_nc/lwup_sfc"
      serviceName="las.xml" />
    <dataset name="meridional wind component"
      urlPath="amip_12b_01all_nc/vcomp" serviceName="las.xml" />
    <dataset name="meridional wind stress"
      urlPath="amip_12b_01all_nc/tau_y" serviceName="las.xml" />
    <dataset name="omega vertical velocity"
      urlPath="amip_12b_01all_nc/omega" serviceName="las.xml" />
    <dataset name="sea level pressure"
      urlPath="amip_12b_01all_nc/slp" serviceName="las.xml" />
    <dataset name="specific humidity"
      urlPath="amip_12b_01all_nc/sphum" serviceName="las.xml" />
    <dataset name="SW flux up at surface"
      urlPath="amip_12b_01all_nc/swup_sfc"
      serviceName="las.xml" />
    <dataset name="temperature" urlPath="amip_12b_01all_nc/temp"
      serviceName="las.xml" />
```

GFDL Data Portal - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

OPeNDAP (FDS) | THREDDS | Index Search: Go

GFDL Data Portal

Datasets > GFDL Data portal

Welcome to LAS.

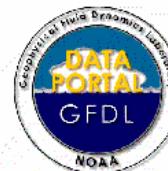
You must have pop-ups enabled for this site in order to see your output.
This session will expire after 180 minutes of inactivity.

Click on a dataset to continue or an  for information about a dataset.

Help

AND ATMOSPHERIC
GEOPHYSICAL AND HYDROLOGICAL
DATA PORTAL
GFDL
NOAA

Welcome to the GFDL Data Portal



nts:
[plus Sulfates Exp 01](#)  [Greenhou](#)
[plus Sulfates Exp 03](#)

Panel on Climate Change E

[century \(exp H1\)](#)
[century \(exp H3\)](#)
[to 2x](#)
[s](#)
[century \(exp H1\)](#)
[century \(exp H3\)](#)

Panel on Climate Change E

[century \(exp H1\)](#)
[century \(exp H2\)](#)
[century \(exp H3\)](#)
[to 2x](#)
[to 4x](#)
[change experiment](#)
[pm stabilization experiment](#)
[m stabilization experiment](#)

asset?catitem=287

LAS Help - Netscape

THREDDS Catalog

The [THREDDS](#) project is bridging the gap between data providers and data users.

A THREDDS catalog is available from each LAS installation (6.5 and above) by connecting to the same URL as the LAS, but substituting **thredds** for **dataset** in the URL.

Clicking [here](#) will deliver an XML THREDDS catalog. You can copy the link location by right clicking the link and selecting **Copy Link Location**, **Copy Shortcut** or a similar option. Paste the URL of the catalog into your favorite THREDDS client to use the data sets installed in this LAS in that client. Clicking the THREDDS [XML Catalog](#) link may result in a blank page in the Web browser. View the page source to see the XML document.

1. LAS can generate a THREDDS catalog
2. LAS will auto-configure from a THREDDS catalog

"addXML" = LAS utility to configure data sets

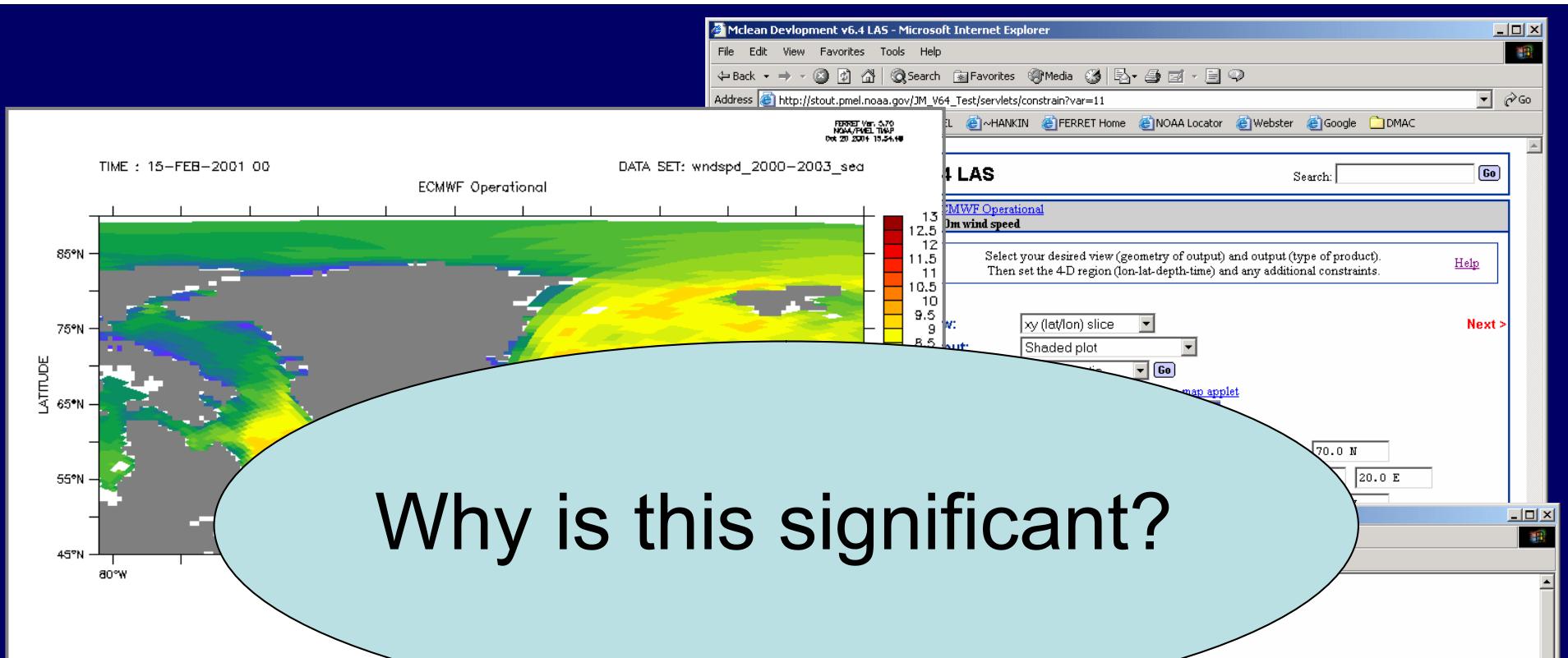
Point addXML at a THREDDS catalog and you get an LAS to access that catalog. E.g. for

- OPeNDAP servers
- GDS and Unidata aggregation servers
- Other LAS servers

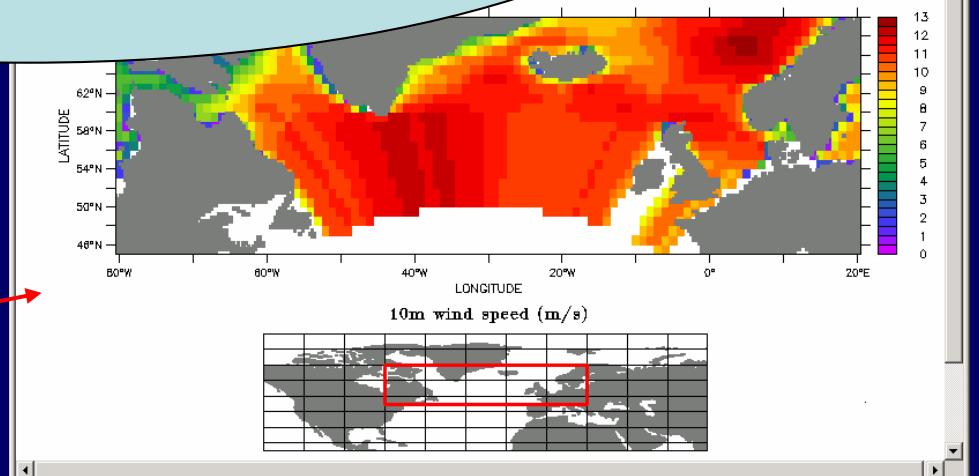
LAS and OPeNDAP

FDS = “Ferret Data Server”

- OPeNDAP output for LAS-served data
- Built on ‘Anagram’ Java framework
(like “GDS” -- from C.O.L.A.)



E.g. On-the-fly
regridding
from **curvilinear**
to **rectilinear**
coordinates



FDS serves this rectilinear “view” through OPeNDAP

LAS browsing
can be
continued
at the desktop

GFDL Data Portal - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://data1.gfdl.noaa.gov:8380/DataPortal/servlets/constrain?var=273

Go

GFDL Data Portal

OPeNDAP (FDS) | THREDDS | Index | Search: [] Go

single data set compare two

Datasets Variables Constraints Output

Previous Output Define variable About

LAS UI Version 6.5

Variables(s): Potential Temperature

Select your desired view (geometry of output) and output (type of product). Then set the 4-D region (lon-lat-depth-time) and any additional constraints.

Select view: xy (lat/lon) slice

Select output: Desktop application data access scripts (circled)

Select region: Full Region [Go] Use the two-click map Help

13.0 N
46.0 E 106.0 E
40.0 S

Zoom In Zoom Out

Map showing a world map with a region highlighted over the Indian and Pacific Oceans.

Select time: 16 Jan 1988 16-Jan-1988

Select depth: 5 5

Select options: ? Desktop application Matlab (circled)

LAS: Desktop Application Data Access Scripts - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Internet

Desktop Application Data Access Scripts

This page contains OPeNDAP URLs for each variable you have selected and provides example data access commands for Matlab.

Note: If you have selected multiple variables, each variable will be provided through a separate OPeNDAP URL.

Click [here](#) to learn more about OPeNDAP.

The following commands use an OPeNDAP URL in your desktop application so you can continue working with the data.

[Matlab](#)

```
loaddods('http://data1.gfdl.noaa.gov/DataPortal-FDS/LAS/ipcc_CM2_0_hi_ocean_tripolar_tracers/thetao?THETAO[1524:1524][0:0][42:120][46:105]')
```

Continuing at the desktop ...

Open the remote dataset (“foo”) like any filename

http://server/FDS/foo

FDS provides server-side analyses:

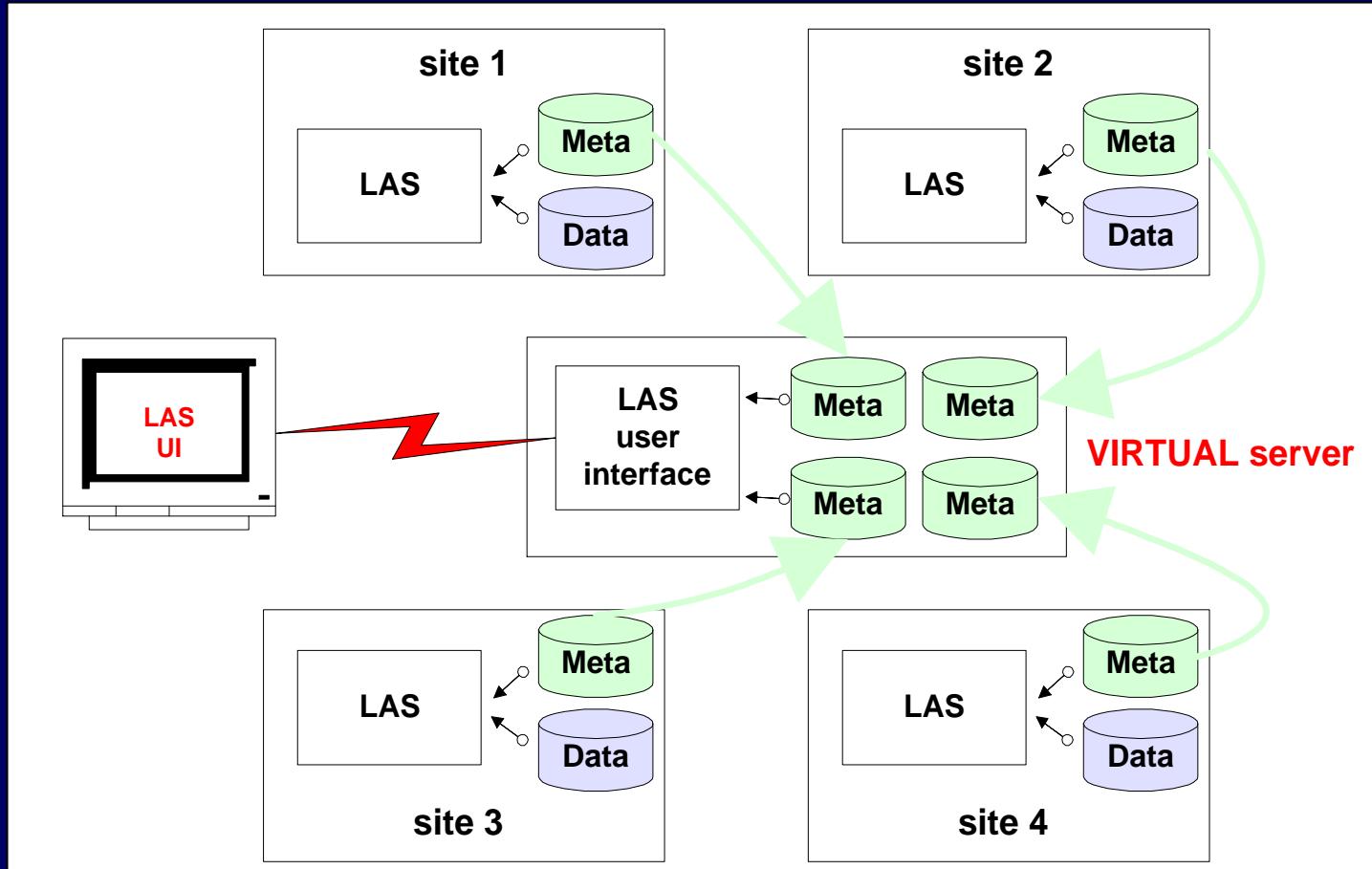
(Z-average of “TEMP”)

http://server/FDS/_expr_{foo}{Tave=TEMP[Z=@AVE]}

FDS employs “delayed analysis”

- the whole dataset appears to be transformed

Collaborating “sister” servers



Comparison between datasets becomes straightforward:
Servers request regridded data from one another via FDS.

Demanding (large)
products may be
created in “batch”
mode

The National Virtual Ocean Data System (NVODS)

Select your desired view (geometry of output) and output (type of product). Then set the 4-D region (lon-lat-depth-time). [Help](#)

Select view: xytvolume (circled in red)

Select output: NetCDF

Select region: Full Region

Next >

Thank You!!

The product you requested is being worked on in the background.

Dataset: http://www.cdc.noaa.gov/cgi-bin/nph-nc/Datasets/recon_reynolds_sst/sst.mnmean.nc
Variable: sst
Product: data file

Three actions are possible from this page:

[Check on product status](#)

[Send email when finished](#)

[Cancel this request](#)

Constraints

Output

Previous Output

Define variable

About

LAS UI Version 6.5

Select time

Select options

Done

I hate outlines

- Review
- What's new
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LAS & GIS

National Geophysical Data Center LAS - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://las.ngdc.noaa.gov/las/servlets/c>

National Geophysical Data

single data set compare two

Datasets Variables

Constraints

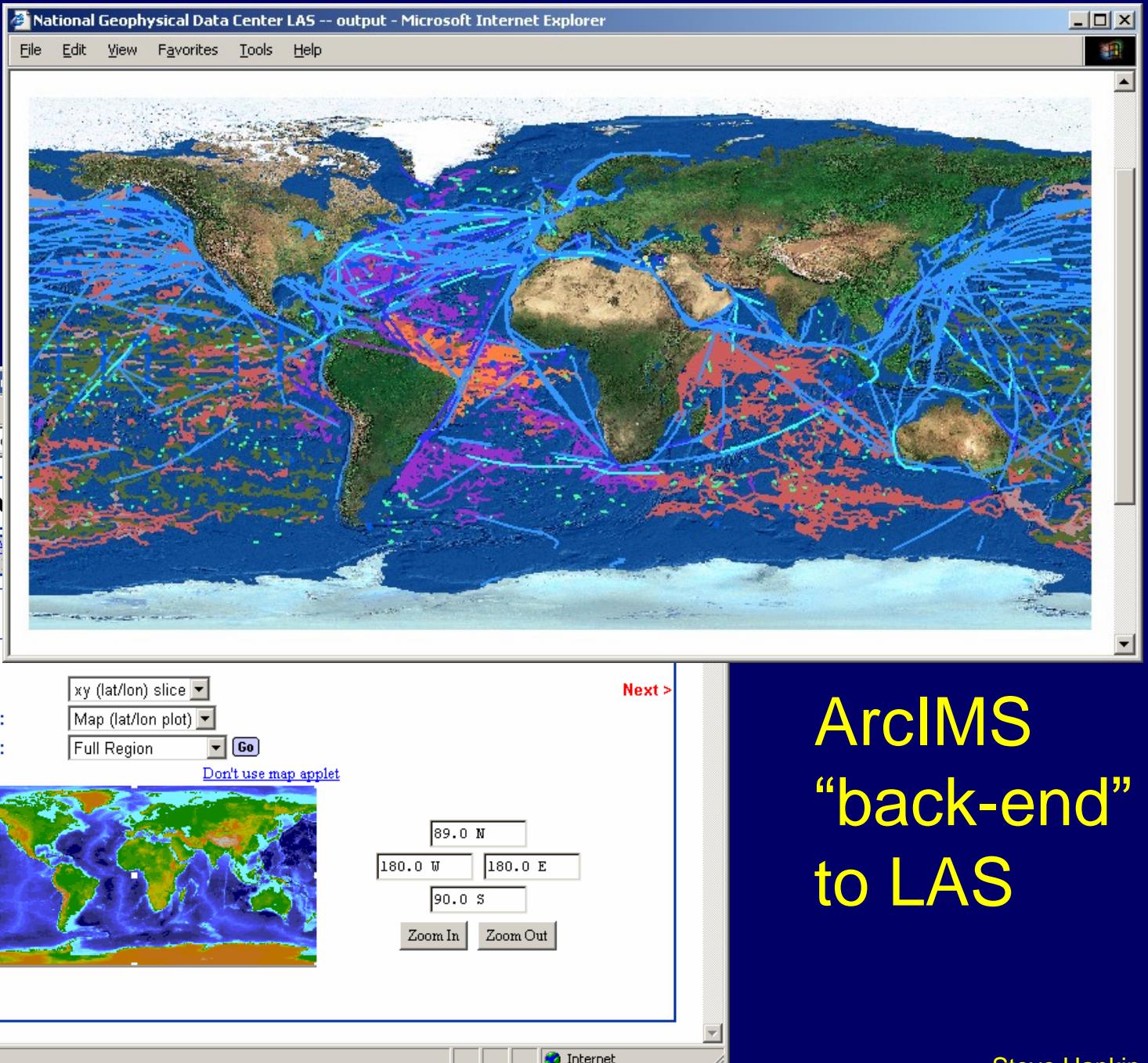
Output

Output Options Previous Output

Define variable

About

LAS UI Version 6.3

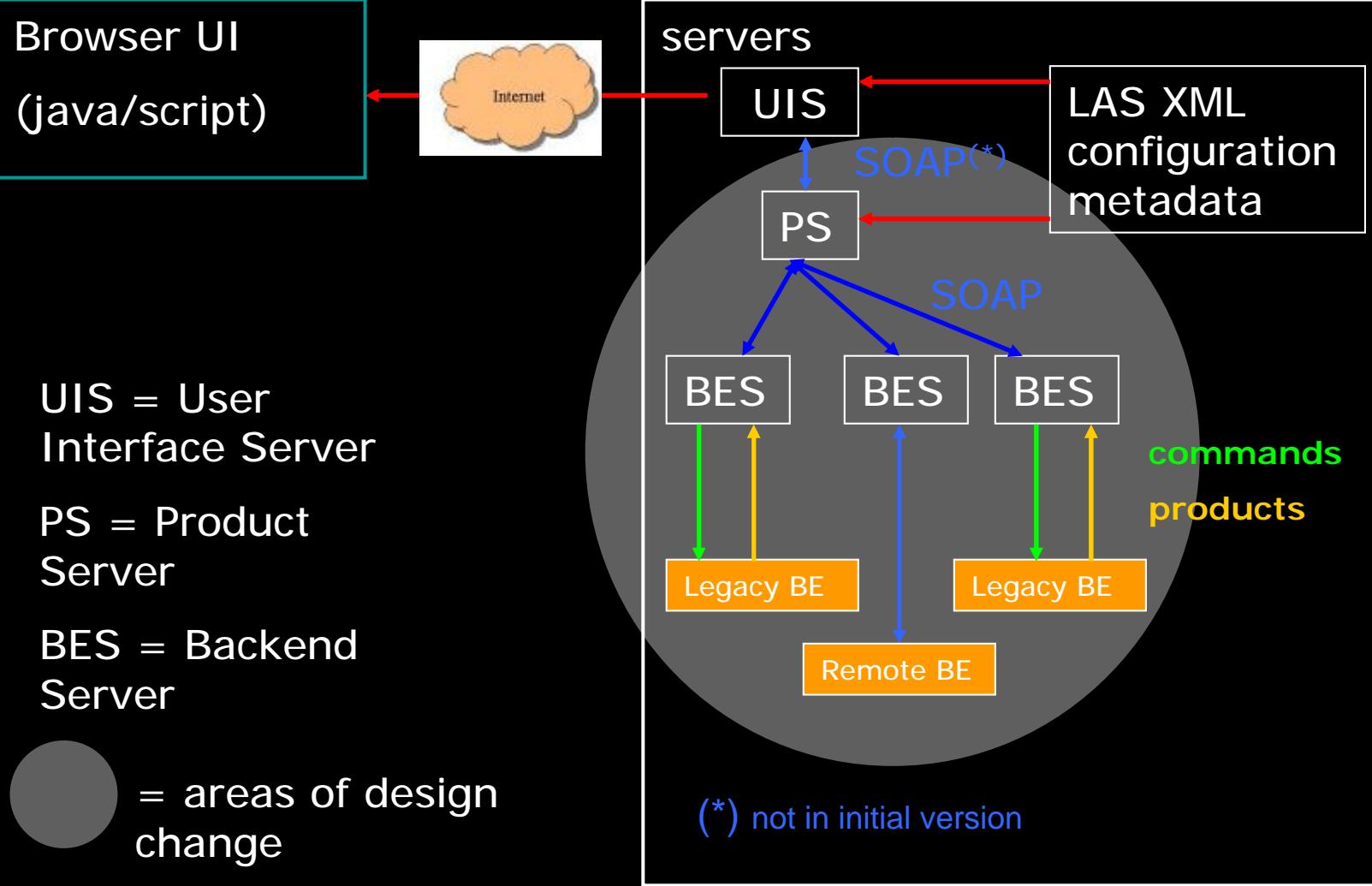


ArclIMS
“back-end”
to LAS

LAS & GIS

- LAS to respond to OGC protocols
 - WMS and WCS (maybe WFS, too)
- LAS UIs in the style of a GIS
- GIS-friendly output products
 - ASCII Grid
 - GeoTIFF
 - ShapeFiles

Component Design for LAS Product Server



Current Product Server (Perl) splits into two components (Java)

1. Product Server

- Parses and completes incoming requests
- Provides logic for caching, batch, security, ...
- May request products from more than one Back-end Servers (compound products)

2. Back-end server

- Produces products using legacy apps or Web services
- Isolated from LAS logic and configuration

Back-end request protocol utilizes JavaBeans exchanged via SOAP

Implementation Details

- Java Servlet based on the Anagram framework from COLA.
- Similar redesign was already planned to accommodate component design for security models
- Singleton instances of PS and BES classes in Servlet container means low memory and fast response
- Jakarta Axis SOAP framework

Conclusion: “Configurable”

Adaptable to input data

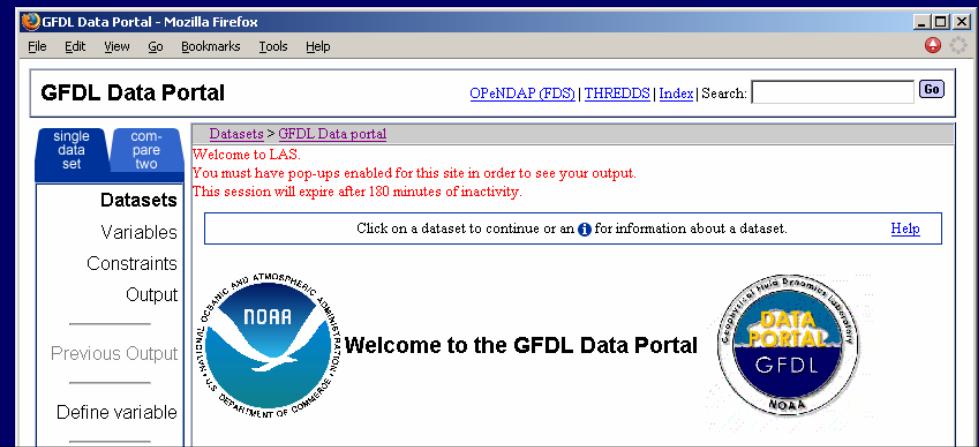
- Models, satellites, *in-situ*
- Local, distributed

Adaptable to output products

- scientific graphics
- extracted subsets
- analysis and comparison

to conclude: the ecological niche of LAS ...

“a configurable
product server
for 1 to 4D
geo-science
datasets”



not necessarily ‘optimal’,
but ...

- very flexible
- community-integrated
- supported (by others)

Who is using LAS?

- US Federal agencies
 - NOAA (PMEL, CDC, GFDL, NCDC, NGDC, NODC, NMFS, ...)
 - NASA (NSIIP, Goddard DAAC, JPL, ...)
 - Navy (FNMOC/GODAE, NAVO)
 - DOE (LLNL, Oak Ridge)
- Research Institutions
 - NCAR
 - MBARI
 - WHOI
 - RSMAS
 - URI/GSO
 - JISAO
 - IPRC
 - COLA
- International
 - France (IFREMER, Mercator, CNRS, Aviso, Mersea, IPSL)
 - UK (UK Met Office, NERC^(*))
 - Germany (Alfred Wegner Institute)
 - Canada (Halifax harbor moorings)
 - Australia (CSIRO)
 - India (Center for Modeling and Simulation)

<http://www.ferret.noaa.gov/LAS>

Current (major) LAS projects at PMEL ...

- REASoN (“thematic servers”)
- GODAE (ocean model inter-comparison)
- HYCOM (HYbrid Coordinate Ocean Model)
- OSMC (Observing System Monitoring Center)
- GFDL data portal (model output dissemination)
- Ocean CO₂ *in situ* data management

Thank you